same formation. These facts, and the acknowledged sudden appearance of large numbers of all the distinct types of invertebrates in the Paleozoic, and of all the greater number of all existing and fossil types before the expiration of Paleozoic time, speak strongly for the quicker evolution of forms in the Paleozoic, and indicate a general law of evolution. This, we think, can be formulated as follows: *Types are evolved more quickly and exhibit greater structural differences between genetic groups of the same stock while still near the point of origin than they do subsequently. The variations or differences may take place quickly in the fundamental structural characteristics, and even the embryo may become different when in the earliest period, but subsequently only more superficial structures become subject to great variations.**

If this applies to the evolution of these cephalopods in the Mesozoic, how much more rapidly and efficaciously did the principle operate in the Precambrian period, after the initial steps in the divergence of types from the unicellular Protozoon took place? The same law or fact obtains with the insects, the eight holometabolous orders having, so far as the evidence goes, originated at nearly the same geological date, near or soon after the close of the Paleozoic era. Williams also shows, from a study of the variations of *Atrypa reticularis*, that this species in its specific characters shows a greater degree of variability of plasticity in the earlier than in the later stages of its history. We thus conclude that after the simplest protoplasmic organisms originated, the greatest difficulties in organic development, *i. e.*, the origination of the founders of the different classes were, so to speak, met and overcome in Precambrian times. The period was one of the rapid evolution of types. As Williams† has well remarked:

"The chief expansion of any type of organism takes place at a relatively early period in its life history. Since then, as with the evolution of the continent itself, the further progressive differentiation of marine invertebrate forms has, since the close of the Precambrian, been a matter of detail."

As well stated by Brooks, since the first establishment of the Cambrian bottom fauna, "evolution has resulted in the elaboration and divergent specialization of the types of structure which were already established, rather than in the production of new types."

In accepting the general truth of this statement, and its application to the marine or Cambrian types it may, however, be modified to some extent. For during the late Paleozoic was witnessed the evolution of the three tracheate, land-inhabiting, air-breathing classes of Arachnida, Myriopoda and insects, and of the air-breathing vertebrates, with limbs and lungs, comprising the four classes of amphibians, reptiles, birds and mammals.

ALPHEUS S. PACKARD.

(*To be concluded*).

*Geological Biology, p. 322.

†*L. c.* p. 347.

BOTANICAL NOTES.

ASPARAGUS RUST.

DR. B. D. HALSTED, of the New Jersey Experiment Station, has issued a bulletin No. 129) on the Asparagus Rust, its treatment and natural enemies, which is of much botanical interest, since it gives good illustrations of all the stages in natural size, and under different magnifications. This rust was described by De Candolle in 1805, and given the name which it now bears, *Puccinia asparagi*. It has been known in Europe for a long time, but was unknown in the United States before 1896. In that year Dr. Halsted detected it in New Jersey, Delaware, Long Island and some portions of New England. In 1897 and 1898 it has

spread southward and westward, but appears to be absent from the Mississippi Valley.

This bulletin is largely concerned with a discussion of the results of spraying with various fungicides. The conclusion is that spring spraying is of little if any practical value, since the reduction in the amount of rust is not proportionate to the cost of the work. Experiments are now in progress to determine whether autumn treatment by spraying or burning will be of any avail. Two natural enemies, both parasitic fungi, *Darluca filum* and *Tubercularia persicina*, have been observed the past year, 'both of which may be expected to assist materially in the checking of the ravages of the asparagus rust.'

POISONOUS PLANTS.

The Division of Botany of the United States Department of Agriculture has issued a bulletin (No. 20), by V. K. Chesnut, upon the principal poisonous plants of the United States, which should be of the utmost use to all who have to deal with plants, from botanists and collectors to hunters and farmers. Only the plants to which attention has been particularly called are included, and it is not to be supposed that the list includes every poisonous species. Good illustrations are freely used, and in all cases general descriptions, popular names, habitat and discussions of the poisonous properties serve to render the account of the greatest value. The plants noticed are the following:

Family Agaricaceae: *Agaricus muscaria*, Fly amanita; *Agaricus phalloides*, Death Cup.

Family Melanthaceae: *Veratrum viride*, American false Hellebore.

Family Convallariaceae: *Convallaria majalis*, Lily-of-the-Valley.

Family Orchidaceae: *Cypripedium reginae*, Showy lady's slipper; *Cypripedium hirsutum*, Larger yellow lady's slipper; *Cypripedium parviflorum*, Smaller yellow lady's slipper.

Family Alsinaceae: *Agrostemma githago*, Corn cockle.

Family Ranunculaceae: *Aconitum columbianum*, Aconite; *Delphinium tricorne*, Dwarf larkspur; *Delphinium geyeri*, Larkspur; *Delphinium menziesii*, Larkspur; *Delphinium recurvatum*, Larkspur; *Delphinium trolliifolium*, Larkspur.

Family Prunaceae: *Prunus serotina*, Black cherry.

Family Cæsalpiniaceae: *Gymnocladus dioica*, Kentucky coffee tree.

Family Papilionaceae: *Astragalus mollissimus*, Woolly loco weed; *Astragalus lambertii*, Stemless loco weed; *Crotalaria sagittalis*, Rattlebox.

Family Euphorbiaceae: *Euphorbia lathyrus*, Caper spurge; *Euphorbia marginata*, Snow on the mountain.

Family Anacardiacaee: *Rhus radicans*, Poison ivy; *Rhus diversiloba*, Poison oak; *Rhus vernix*, Poison sumac.

Family Sapindaceae: *Aesculus pavia*, Red buckeye.

Family Apiaceae; *Cicuta maculata*, Water hemlock; *Cicuta vagans*, Oregon water hemlock; *Conium maculatum*, Poison hemlock.

Family Ericaceae: *Kalmia latifolia*, Broadleaf laurel; *Kalmia angustifolia*, Narrow-leaf laurel; *Rhododendron maximum*, Great laurel; *Pieris mariana*, Stagger bush; *Leucothöe catesbaei*, Branch ivy.

Family Loganiaceae: *Gelsemium sempervirens*, False jessamine.

Family Solanaceae: *Datura stramonium*, Jimson weed; *Datura tatula*, Jimson weed; *Solanum nigrum*, Black nightshade; *Solanum dulcamara*, Bittersweet; *Solanum triflorum*, Spreading nightshade.

Family Carduaceae: *Helenium autumnale*, Sneezeweed.

EDIBLE AND POISONOUS FUNGI.

Another bulletin (No. 15) from the Di-

vision of Vegetable Physiology and Pathology of the United States Department of Agriculture which will attract more than usual attention is that on 'Some Edible and Poisonous Fungi,' by Dr. W. G. Farlow, of Harvard University. In the introduction the author says: "The question which everyone asks first is: How can you tell a mushroom from a toadstool? This is one of the questions which no one can answer, unless an explanation of why the question should never be asked may be considered an answer. You cannot tell a mushroom from a toadstool, because mushrooms are toadstools. The reason why the question is so frequently asked is because the belief is well-nigh universal in this country that the fleshy umbrella-shaped fungi are divided into two classes, mushrooms, which are edible, and toadstools, which are poisonous. This assumed difference does not in fact exist. All the fleshy umbrella-shaped fungi are toadstools, and to a small number of the best-known edible forms the name mushroom is applied popularly and in commerce; but not a small number of the other toadstools are edible, and a great many of them, probably the most of them, are not poisonous."

As to how we may tell an edible from a poisonous fungus, the author says: "Our knowledge on this point is empirical. We know that certain species are edible, and others are poisonous, because people have eaten the former and found them to be good, while the latter have produced unpleasant symptoms and even death." He says further that "with regard to the species which have not been tried experimentally or accidentally we can only say that they are probably edible or poisonous, judging by their resemblance to other species known to be such. Although, in the absence of experience, analogy is the only guide, it is not a sure guide, and unpleasant surprises may arise."

The sections which follow treat of growth, structure and characteristics of toadstools, followed by descriptions and figures of *Agaricus campestris*, the common mushroom, (edible); *Amanita muscaria*, the fly Agaric (poisonous); *Amanita phalloides*, the deadly Agaric (poisonous); *Agaricus arvensis*, the horse mushroom (edible); *Hypholoma appendiculatum* (edible); *Coprinus comatus*, the horsetail fungus (edible); *Lepiota procera*, parasol fungus (edible); *Cantharellus cibarius*, chanterelle (edible); *Marasmius oreades*, fairy-ring fungus (edible); tube-bearing fungi, morels, puff-balls, etc. A half dozen rules for the use of beginners close this valuable paper. It should be in the hands of every teacher of botany, from colleges and universities down through the high schools into the grammar and primary grades.

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CURRENT NOTES ON METEOROLOGY.

REPORT OF THE CHIEF OF THE WEATHER BUREAU.

FROM the *Report of the Chief of the Weather Bureau for 1896–97* we learn that during the last fiscal year a total of 4,625,250 weather maps was issued, and that daily forecasts and warnings were sent to 51,694 places, by mail, telegraph, telephone, etc. There are now 81 map-printing stations outside of Washington, D. C.; about 8,000 places from which climate and crop conditions are reported, and about 3,000 voluntary observers make daily observations. The stations at which storm signals are displayed number 253. The river and rainfall stations, making daily observations to be used in river and flood forecasts, number 113 and 42 respectively. Substantial progress has been made in perfecting the kites used in the exploration of the free air, and it is hoped soon to publish daily weather charts based on the high-level readings made by means of in-